

WHAT IS CLAIMED IS:

1. A mobile radio communication apparatus
applicable to a plurality of radio communication
systems, comprising:

5 a wireless transmitter-receiver device configured
to perform transmission/reception of a radio signal;
 a signal processing device including a resource to
which functions are defined, wherein the resource
handles at least a modem function and a protocol
10 function, and configured to perform a signal processing
necessary in the transmission/reception by use of the
resource; and

 a controller which controls said signal processing
device to redefine, to the resource, another modem
15 function and another protocol function corresponding to
respective one of the mobile communication systems.

2. A mobile radio communication apparatus
according to claim 1, wherein said signal processing
device comprises:

20 a general-use processor serving as a part of said
resource and configured to carry out a part of said
signal processing by executing a given program; and

 a signal processing unit serving as another part
of said resource and configured to carry out another
25 part of said signal processing; and

 said general-use processor comprises a register
array configured to retain data directly

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transmitted/received between the general-use processor
itself and the signal processing unit.

3. A mobile radio communication apparatus
according to claim 1, wherein said signal processing
5 device comprises:

at least one programmable hardware device serving
as a part of said resource and including a circuit
structure capable of being redefined according to a set
of a plurality of logic circuits which carry out basic
10 calculations of at least a part of said signal
processing; and

a general-use processor serving as another part of
said resource and configured to carry out at least
another part of said signal processing by executing a
15 predetermined program; and

said controller determines respective shares of
processing to be executed by said programmable hardware
device and the general-use processor in accordance with
the contents of said signal processing and controls
20 said signal processing device to define, to the
resource, the signal processing functions in accordance
with determination of the share.

4. A mobile radio communication apparatus
according to claim 1, wherein said signal processing
25 device comprises:

at least one programmable hardware device serving
as at least a part of said resource and including

a circuit structure capable of being redefined according to a set of a plurality of logic circuits which carry out basic calculations of at least a part of said signal processing;

5 a first memory which stores a program indicating a procedure of said signal processing;

 a second memory which stores a plurality of circuit structure descriptions of said programmable hardware device corresponding to processing contents
10 respectively, the circuit structure descriptions being used for said signal processing device to carry out said signal processing; and

 a program sequencer configured to control the programmable hardware device and said second memory to
15 revise the circuit structure descriptions of said programmable hardware device in accordance with the program read out from said first memory under a control of said controller.

 5. A mobile radio communication apparatus
20 according to claim 4, wherein said signal processing device further comprises a general-use processor serving as another part of said resource and configured to carry out at least another part of said signal processing by executing a given program; and said
25 program sequencer determines respective shares of processing to be executed by said programmable hardware device and the general-use processor in accordance with

the program read out from said first memory , selects one of said plurality of circuit structure descriptions stored in said second memory in accordance with determination of the shares and supplies selected description to said programmable hardware device, and gives an execution instruction of the processing to be shared by said general-use processor to said general-use processor.

6. A mobile radio communication apparatus applicable to a plurality of radio communication systems, comprising:

a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

a signal processing device including a resource to which signal functions are defined, and configured to perform a signal processing necessary in the transmission/reception by use of the resource; and

a controller which controls said signal processing device to redefine, to the resource, a newly required signal processing function in accordance with a resource amount necessary for redefining the newly required signal processing function of the resource and a residual resource amount.

7. A mobile radio communication apparatus according to claim 6, wherein said controller acquires structure description information indicating a structure of said newly requested signal processing

function provided from an outside of said radio communication apparatus, and controls said signal processing device to define, to the resource, the newly required signal processing function in accordance with
5 a resource amount necessary for defining the newly required signal processing function of the resource and an excessive residual resource amount, with use of the acquired structure description information.

8. A mobile radio communication apparatus
10 according to claim 6, wherein

(a) said controller acquires structure description information provided from outside of said radio communication apparatus via said wireless transmitter-receiver device, the structure description information
15 indicating a structure of said newly requested signal processing function;

(b) said controller obtains a resource amount necessary for defining, to the resource, the newly required signal processing function of the resource
20 with use of the acquired structure description information;

(c) said controller compares said resource amount obtained and an initial resource amount preset in said signal processing device with each other;

25 (d) said controller grasps said excessive source amount when the obtained resource amount is smaller than the initial resource amount;

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(e) said controller determines if it is possible to additionally define said newly requested signal processing function to said resource by comparing the grasped excessive resource amount with the resource amount necessary for defining, to the resource, the newly required signal processing function of the resource; and

(f) said controller executes an additional definition when it is determined that the additional definition can be done.

9. A wireless system comprising:

the mobile radio communication apparatus according to claim 7; and

an information providing apparatus configured to provide the structure description information to said controller of said mobile radio communication apparatus.

10. A wireless system according to claim 9, characterized in that said information providing apparatus is installed in a base station which carries out radio communications with said mobile radio communication apparatus.

11. A wireless system according to claim 9, wherein said wireless transmitter-receiver device is configured to perform transmission/reception of a radio signal with said information providing apparatus; and said information providing apparatus comprises:

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an another wireless transmitter-receiver device configured to perform transmission/reception of a radio signal with said mobile radio communication apparatus; and

5 an another controller configured to control said another wireless transmitter-receiver device to provide the controller with information for defining, to the resource, the newly required signal processing function in accordance with the resource amount and the
10 excessive residual resource amount, the resource amount and excessive residual resource amount being grasped based on information acquired by the another controller and containing a use status of said resource.

12. A mobile radio communication apparatus
15 applicable to a plurality of radio communication systems, comprising:

 a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

 a signal processing device including a resource
20 capable of redefining a signal processing function based on a predetermined software module, and configured to perform a signal processing necessary in the transmission/reception by use of the resource; and

 a storage device configured to store a plurality
25 of software modules respectively corresponding to said plurality of radio communication systems; and

 a controller which reads out at least one software

module corresponding to one of the mobile communication systems which is used by said mobile radio communication apparatus from said storage device , and controls said signal processing device and said storage device to supply the read-out software module to the resource.

13. A mobile radio communication apparatus according to claim 12, wherein said storage device is configured further to store a plurality of software modules respectively corresponding to a plurality of communication systems of different types; and

said controller is configured to read out at least one software module corresponding to a type of communication conducted by said mobile radio communication apparatus from said storage device and to control said signal processing device and said storage device to assign the read-out software module to the resource.

14. A mobile radio communication apparatus according to claim 12, wherein said controller characterized by comprises:

a resource manager configured to manage a timing for determining a rewriting order of the software modules in the resource, whether or not the software modules should be rewritten, and a timing for rewriting; and

a rewrite processor configured to read out

a predetermined one of the software modules from said storage device based on an instruction from said resource manager and to assign the read-out module to the resource thereby rewriting the software modules in the resource.

15 15. A mobile radio communication apparatus according to claim 12, wherein said controller comprises:

10 a resource manager configured to manage a timing for determining a rewriting order of the software modules in the resource, whether or not the software modules should be rewritten, and a timing for rewriting;

15 a download buffer configured to buffer at least one software module downloaded from outside; and

20 a rewrite processor configured to read out at least one software module from at least one of said storage device and said download buffer based on an instruction from said resource manager and to assign the read-out module to the resource thereby rewriting the software modules in the resource.

16. A mobile radio communication apparatus applicable to a plurality of radio communication systems, comprising:

25 a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

 a signal processing device including a resource

to which signal functions are defined based on
a predetermined software module, and configured to
perform a signal processing necessary in the
transmission/reception by use of the resource;

5 a storage device configured to store a plurality
of software modules respectively corresponding to
a plurality of signal processing functions executed by
said signal processing device, and a table which
records at least a use log of each of said plurality of
10 software modules; and

 a controller which controls said signal processing
device and said storage device to read out at least one
software module corresponding to a signal processing
function to be executed by said signal processing
15 device from said storage device, to assign the read-out
software module to said signal processing device, and
to rewrite at least one of the software modules stored
in said storage device with reference to the table.

17. A mobile radio communication apparatus
20 according to claim 16, wherein said storage device
stores a use frequency of each of said plurality of
software modules in the table as a use log of each of
the software modules; and

 said controller controls said storage device to
25 rewrite the software modules by deleting one software
module with a minimum use frequency of said plurality
of software modules stored in said storage device with

reference to the table.

18. A mobile radio communication apparatus
according to claim 16, wherein said storage device
stores a latest use date and time of each of said
5 plurality of software modules in the table as a use log
of each of the software modules; and

said controller controls said storage device to
rewrite the software modules by deleting one software
module with an oldest use data and time of said
10 plurality of software modules stored in said storage
device with reference to the table.

19. A mobile radio communication apparatus
according to claim 16, wherein said storage device
stores a size of each of said plurality of software
15 modules in the table as a use log of each of the
software modules; and

said controller controls said storage device to
rewrite the software modules by deleting one software
module with a largest size of said plurality of
20 software modules stored in said storage device with
reference to the table.

20. A mobile radio communication apparatus
according to claim 16, wherein said storage device
stores a version of each of said plurality of software
25 modules in the table as a use log of each of the
software modules; and

said controller controls said storage device to

compare a version of at least one software module corresponding to a signal processing function to be executed by said signal processing device with the versions of the software modules stored in said storage device with reference to the table, and when the versions of these software modules are equal to each other, said controller reads the software modules from said storage device and assigns the read-out modules to said signal processing device.

21. A mobile radio communication apparatus according to claim 20, wherein said controller further comprises a download buffer configured to buffer at least one software module downloaded from outside, and controls said signal processing device to download at least one software module corresponding to a signal processing function to be executed by said signal processing device when the versions of these software modules are not equal to each other, to buffer it to said download buffer and assign the buffered module to said signal processing device.

22. A radio communication apparatus applicable to a plurality of radio communication systems, comprising:

a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

a signal processing device including a resource to which signal functions are defined based on a predetermined software module, and configured to

perform a signal processing necessary in the
transmission/reception by use of the resource;

5 a storage device configured to store a plurality
of software modules respectively corresponding to a
plurality of signal processing functions executable by
said signal processing device in correspondence with
the radio communication systems , a plurality of first
data files each having a file format corresponding to
unique application software prepared for each of the
10 radio communication systems, and a second data file
having a common file format;

a first converter device configured to execute
conversion of at least one of said plurality of first
data files stored in said storage device into the
15 second data file, and newly store the second data file
in said storage device;

a second converter device configured to execute
conversion of at least one of said plurality of second
data files stored in said storage device into at least
20 one first data file; and

a controller configured to control said signal
processing device and said storage device to read out a
software module corresponding to a predetermined one of
the radio communication systems from said storage
25 device and to assign the read-out software module to
said signal processing device.

23. A mobile radio communication apparatus

according to claim 22, wherein said controller includes a processor;

5 said first converter device executes conversion as said processor executes a first software for conversion; and

 said second converter device executes conversion as said processor executes a second software for conversion.

10 24. A mobile radio communication apparatus according to claim 22, wherein said second converter device converts at least one of the second data files stored in said storage device into a first data file having a file format corresponding to unique application software prepared for said predetermined
15 one mobile communication system, when said controller reads out the software module corresponding to said predetermined one of the radio communication systems from said storage device and assigns the read-out software module to said signal processing device.

20 25. A mobile radio communication apparatus according to claim 22, wherein said application software includes a telephone directory management software and said storage device stores a telephone number file as the first and second data files.

25 26. A mobile radio communication apparatus according to claim 22, wherein said application software includes a browsing software for Web pages and

said storage device stores a URL (uniform resource locators) file as the first and second data files.

27. A mobile radio communication apparatus according to claim 22, wherein said application
5 software includes an e-mail software and said storage device stores an e-mail file as the first and second data files.

28. A mobile radio communication apparatus according to claim 22, wherein said application
10 software includes an e-mail software and said storage device stores a mail address file as the first and second data files.